Ordering number: EN 3346

Monolithic Digital IC



No.3346

LB1688

3-Phase Brushless Motor Driver

Applications

The LB1688 is a 3-phase brushless motor driver IC ideally suited for use in VTR capstan motor, drum motor drive applications.

Features and Functions

(1) 120° voltage linear type
(2) Soft switching type eliminating noises caused by current switching and making the values of external capacitors smaller (comparable to those of chip capacitors)
(3) On-chip thermal shutdown

Absolute Maximum Ratings at Ta = 25°C

			unit
Maximum Supply Voltage	V_{CC} max1	20	V
	V_{CC} max2	7.0	V
Output Supply Voltage	$V_{OUT.V.W.}$	22	V
Output Current	I_{OUT}	1.5	A
Allowable Power Dissipation	Pd max	2.1	W
Operating Temperature	Topr	−20 to +75	°C
Storage Temperature	Tstg	−55 to +125	°C

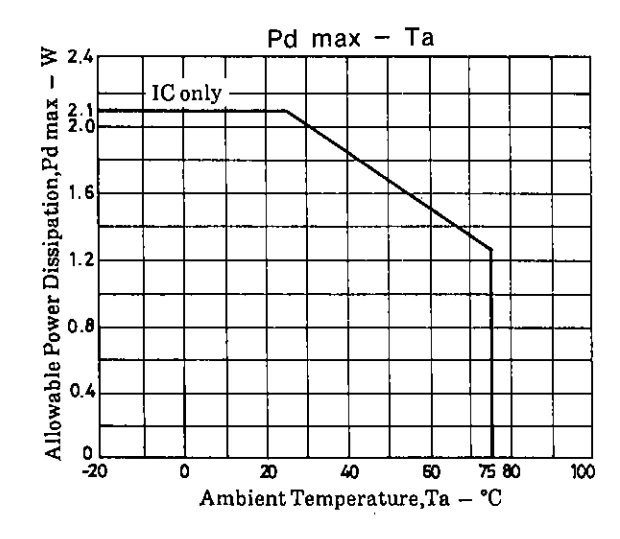
Allowable Operating Conditions at Ta = 25°C

			unit
Supply Voltage	$V_{CC}1$	8.5 to 18	V
	$V_{CC}2$	4.3 to 6.5	V

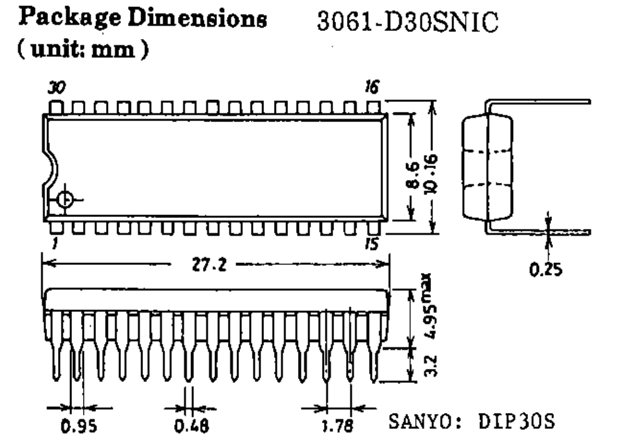
Electrical Characteristics at Ta = 25°C, $V_{CC}1$ = 12V, $V_{CC}2$ = 5V

[Power Supply]			min	typ	max	unit
Supply Current 1	$I_{CC}1$	$V_C = 0, R_L = \infty$		17	30	mA
Supply Current 2	$I_{CC}2$	$V_C = 0$		6.5	9.5	mA

Continued on next page.



Package Dimensions 3061-D30SNIC
(unit: mm)



Continued from preceding page.

Parameter	Symbol	Conditions	min	typ	max	unit
[Output]						
Output Saturation Voltage	$V_{O(sat)}1$	I_{OUT} = 0.5A, sink + source		1.6	2.2	V
	$V_{O(sat)}2$	I_{OUT} = 1.0A, sink + source		2.0	3.0	V
Output TRS Voltage	$V_{O(sus)}$	I_{OUT} = 20mA (See note.)	20			V
Output Quiescent Voltage	V_{OQ}	$V_C = 0$	5.8	6.1	6.4	V
[Hall Input-Output]						
Hall Amp Input Offset Voltage	V_H offset		−5		+5	mV
Hall Amp Input Bias Current	I_H bias			1	5	μA
Hall Amp Common-Mode Input Voltage Range	V_H ch		1.3		3.7	V
Hall Input-Output Voltage Gain	G_{VHO}			43		dB
[Control-Output]						
Control-Output Drive Gain	G_{VCO}		38	41	44	dB
Control-Output CH Difference	ΔG_{VCO}		−2		+2	dB
[Motor Detection]						
Thermal Shutdown Temperature	T_{SD}	(See note.)	150	180	210	°C
Thermal Shutdown Hysteresis	ΔT_{SD}	(See note.)		15		°C

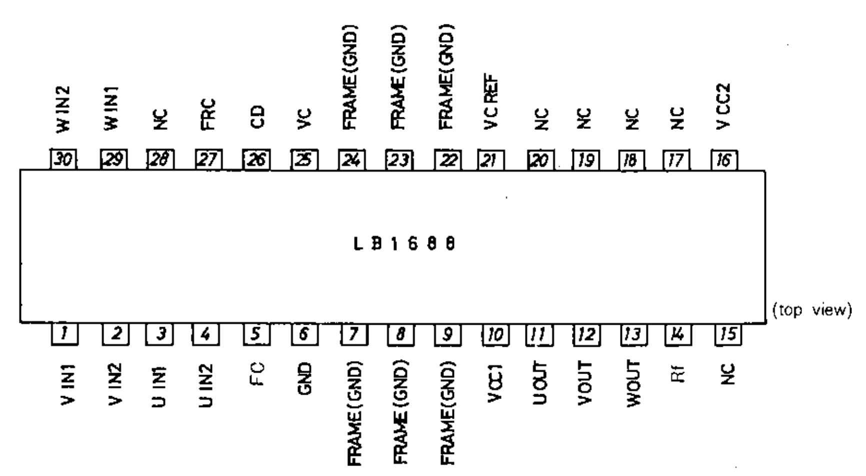
Note : Values shown are design targets only. No measurements have been taken.

Equivalent Circuit Block Diagram

Unit (resistance: Ω, capacitance: F)

0.01μ
0.01μ
0.01μ
0.01μ
+5V
5V
Forward/reverse
Matrix FR
Amplitude control
TSR
Reference voltage
Vc
12V
0.1μ
CL
1.4V
VCREF
5V
Rf 0.47
0.047μ x3
13 x3
LB1688

Pin Assignment



Note : All FRAME pins are connected to GND.

Pin Description

Pin Name	Pin No.	Description
$U_{IN}1$, $U_{IN}2$ $V_{IN}1$, $V_{IN}2$ $W_{IN}1$, $W_{IN}2$	3, 4 1, 2 29, 30	U phase hall element input pin. 'H' of logic : $V_{IN}1 > V_{IN}2$ V phase hall element input pin. 'H' of logic : $V_{IN}1 > V_{IN}2$ W phase hall element input pin. 'H' of logic : $V_{IN}1 > V_{IN}2$
U_{OUT} V_{OUT} W_{OUT}	11 12 13	U phase output pin V phase output pin W phase output pin
$V_{CC}1$	10	Power supply pin for applying output
$V_{CC}2$	16	Power supply pin for applying voltage to each section other than output section. This voltage must be stabilized to be free from ripple, noise, etc.
Rf	14	Output current detect pin. By connecting Rf across this pin and GND pin, output current is detected as voltage. The result is used to control the overcurrent protection circuit.
CD	26	Pin for fetching current (voltage) detected with Rf. Takes feedback from Rf to reduce output voltage gain. Ground when not in use.
FC	5	Frequency characteristic correction
V_C	25	Speed-phase control pin Control is of voltage-controlled type that controls output voltage.
V_{CREF}	21	Control reference voltage
GND	6	GND for other than output Minimum potential of output transistor is at Rf pin.
F/RC	27	Forward/reverse control pin By setting this pin to 'H' (more than 2.0V)/'L' (less than 0.3V), truth value is changed to perform forward/reverse rotation.

Truth Table

	Source → Sink			Input			Forward/Reverse Control
				U	V	W	F/RC
1	W phase	→	V phase	H	H	L	L
	V phase	→	W phase				H
2	W phase	→	U phase	H	L	L	L
	U phase	→	W phase				H
3	V phase	→	W phase	L	L	H	L
	W phase	→	V phase				H
4	U phase	→	V phase	L	H	L	L
	V phase	→	U phase				H
5	V phase	→	U phase	H	L	H	L
	U phase	→	V phase				H
6	U phase	→	W phase	L	H	H	L
	W phase	→	U phase				H

Input:
- H: High level. One of the inputs should have a potential at least 0.2V higher than the other.
- L: Low level. One of the inputs should have a potential at least 0.2V lower than the other.

Forward/reverse control:
- H: 2.0 to $V_{CC}2$
- L: 0 to 0.3V